REMARKS

By this Amendment claim 9 has been canceled and replaced by new claims 12-16, each of these claims being directed to an aerosol composition containing a biliquid foam, an aqueous phase and a propellant, with claim 12 reciting inclusion of a wax and being a polish, claim 13 reciting inclusion of a perfumed component and being an air freshener, claim 14 reciting inclusion of an active repellent agent and being a repellent, claim 15 reciting inclusion of a surfactant and a humectant and being a shaving preparation (pre- or post-shaving), and claim 16 reciting inclusion of at least one of surfactants, lubricants, humectants, foaming agents, fragrances, fatting acids and bases and being a follicle softener. With respect to claim 15, note the specification at page 8, lines 20-25 (see attached pages 163-165 of Harry's Cosmeticology), and with respect to claim 16, note the specification at page 9, lines 8-10.

It is believed that claims 12-16 overcome the examiner's formality objections against former claim 9, and the applicant requests that these claims be allowed with claims 10 and 11.

The additional claims fee should be charged to Deposit Account No. 04-2223.

Respectfully submitted,

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composition:

	(6) *per cent*
Potassium soap from stearic acid/coconut oil fatty acids (80:20)	1·5
Potassium polyacrylate (polyacrylic acid mol. wt 100 000–200 000)	1·0
Polyvinylpyrrolidone	0·5
Stearic acid/coconut oil fatty acids (80:20)	3·0
Castor oil	3·0
Lauric acid diethanolamide	0·5
Polyoxyethylene sorbitan monolaurate	0·5
Perfume	0·5
Water	89·5

Guidance on Formulation

The following general guidance can be given in the formulation of aerosol shaving foams.

Fatty Acids. Saturated long-chain fatty acids containing 12 to 18 carbon atoms at a level of 7–9 per cent are the main components of aerosol shaving foams. Lower-molecular-weight fatty acids such as those found in unstripped coconut oil cause skin irritation. The ratio of the fatty acids can be varied widely to produce foams with different physical properties. The presence of stearic acid is not essential to an aerosol foam as might be inferred from the early patents. A high proportion of stearic acid in the fatty acid mixture tends to give stiffer foams and a reduction in the number of shaves per can. Replacing some of the stearic acid with lauric acid tends to produce softer foams and improves the expulsion characteristics.

Bases. Triethanolamine, potassium hydroxide or mixtures of the two are the preferred bases for the saponification of the fatty acids. Sodium hydroxide is rarely used and then only as a minor constituent. Mono- and diethanolamines are used occasionally but care is needed to avoid skin irritation. Triethanolamine soaps tend to give closer-knit foams than potassium soaps, particularly with fluorocarbon propellants.

It is common practice to adjust the quantity of base so that the formulation contains 1–3 per cent free fatty acid. The free fatty acid can improve the appearance and lubricity of the foam and, by complexing with the soap, increase foam stability. However, this may be at the expense of reducing the amount of available foam and increasing the rate at which the foam dries out on the face.

Surfactants. A wide variety of anionic and nonionic synthetic surfactants can be used in shaving foams to improve such properties as the emulsion stability (for example, self-emulsifying glycerol monostearate), the wetting properties of the foam (for example, sodium lauryl ether sulphate), the water dispersability of the foam and shaving debris (for example, polyethoxylated fatty alcohols), the foam stability (for example, lauric diethanolamide) and emolliency (for example, ethoxylated lanolins). Because of the complex nature of the interactions between surfactants, soaps and free fatty acids, their interfacial properties in the emulsion and foam are not easily predicted.

Humectants. Polyols such as glycerol, sorbitol or propylene glycol are usually added to shaving foam concentrates at a level of 3–10 per cent. By their ability to bind water, they reduce the tendency of the foam to dry out on the face.

Lubricants. To assist the passage of the razor over the face and to provide emolliency, additional lubricants such as mineral oils, silicone fluids, lanolin or isopropyl myristate can be included at a level of 1 to 2 per cent, to supplement the effects of the free fatty acid. Water-soluble polymers such as polyvinyl pyrrolidone, sodium carboxymethyl cellulose or polyacrylic acid and its derivatives can also improve lubrication and increase foam stability. Polyvinylpyrrolidone is said to act as an anti-irritant, that is, to reduce the irritancy caused by other compounds.

Propellants. Aerosol shaving foams contain either 7–10 per cent fluorocarbon propellant or 2·8–3·5 per cent hydrocarbon propellant. The fluorocarbon propellants are usually 40:60 to 60:40 weight ratio blends of dichlorodifluoromethane and dichlorotetrafluoroethane. The hydrocarbon propellants are mixtures of *n*-butane, isobutane and *n*-propane.

The higher the concentration of propellant, the lower the foam density, the stiffer the foam and the greater the number of shaves that can be obtained from a given weight of the emulsion. Foams having a density less than 65 $g\,l^{-1}$ are likely to be difficult to spread on the face and have little beard-softening capability.

In spite of the higher cost, fluorocarbon-propelled shaving foams became very popular, possibly because of the relative ease of forming close-textured, stable foams. Following the Rowland and Molina[18] hypothesis of stratospheric ozone depletion by fluorocarbon propellants and legislation in the USA, all US aerosol shaving foams are now based on hydrocarbon propellants. The best selling UK aerosol shaving foams are also based on hydrocarbon propellants.

Perfume. Soap-compatible perfumes are used at a level of 0·15–0·65 per cent.

Cooling Agents. Physiological cooling agents are often added to shaving foams to counteract the 'after-glow' associated with shaving. The most frequently used cooling agent is menthol at a concentration of 0·05–0·2 per cent. The volatility of menthol means that its cooling effect on skin is transient and its dominant odour is almost impossible to mask. A group of compounds ranging in chemical type from carboxamides to ureas to phosphine oxides have been shown to possess physiological cooling properties.[19] Many are as effective as menthol but without the disadvantages associated with the volatility of menthol. At a level of 0·1–0·2 per cent in shaving foams, the cooling effect can last for 5–15 minutes after application.

Colour. Foams may be coloured by the use of D&C or FD&C dyes. A very low concentration should be used to avoid staining the skin and towel.

Preservatives. Many shaving foams do not require a preservative; however, when necessary 0·2 per cent of a mixture of methyl and propyl *p*-hydroxybenzoate should suffice.

Antioxidants are
containing even low

Corrosion Inhibitors.
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containers.

Bacteriostats, etc. 0·0
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Pilomotor Agents. It
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patented compounds
4',6'-dimethylbenzyl)
for example 2-(3'-
diazacyclopentenes-(

A number of the
lather shaving creams

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Example Formulatio

Fluorocarbon-

A Stearic ac
Palmitic a
Isopropyl
Coco mon

B Sodium la
Triethanol
Glycerol
Water (de

Perfume

Conc
Prope

Antioxidants are sometimes required to avoid rancidity in formulations containing even low levels of unsaturated compounds.

Corrosion Inhibitors. Again these are not normally required with suitably lacquered containers. Borax (0·04 per cent, 10 mol) can be used with tinplate containers and 0·25 per cent of sodium silicate 35° Be solution with aluminium containers.

Bacteriostats, etc. 0·05 per cent trichlorohydroxydiphenyl ether (Irgasan DP300) and 0·05 per cent allantoin should reduce skin infections and promote healing of cuts.

Pilomotor Agents. It is claimed that a closer shave can be obtained by incorporating into the shaving preparation compounds having pilomotor activity—that is, ability to cause the contraction of the arrectores pilorum (hair follicle muscles). This contraction causes the beard hair to be pushed farther above the skin surface line by about 0·2–0·3 mm. A hair cut in the elevated position will retract below the skin surface as the follicle muscle returns to normal. Such patented compounds included: imidazolines,[20] for example, 2-(2′,5′-dimethoxy-4′,6′-dimethylbenzyl)-2-imidazoline; 2-amino-imidazolines;[21] morpholines,[23] for example 2-(3′-hydroxyphenyl)-morpholine; and 2-(phenylamino)-1,3-diazacyclopentenes-(2).[23]

A number of the above compounds can also be used to the same effect in lather shaving creams, brushless shaving creams and pre-electric shave lotions.

A statistical study of the formulation of aerosol shaving foams[24] examined the importance of a number of variables such as soap concentration, fatty acid type, free fatty acid concentration, polyol type and concentration, and propellant type and concentration. The concentrate was evaluated in terms of viscosity, pH, density and stability, while the discharge properties and foam were evaluated in terms of the number of shaves per can, residue in the can after discharge, foam density, foam strength, drying time and bubble size. A number of the findings of the study have been included in this section.

Example Formulations

Fluorocarbon-propelled shaving foam		(7) *per cent*
A	Stearic acid	5·6
	Palmitic acid	2·2
	Isopropyl myristate	1·0
	Coco monoethanolamide	0·3
B	Sodium lauryl ether sulphate (40% solution)	3·5
	Triethanolamine	3·9
	Glycerol	5·0
	Water (deionized)	78·5
	Perfume	*q.s.*
	Concentrate	91·5
	Propellants 12/114 (40:60)	8·5